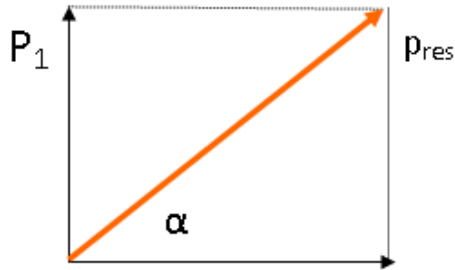a 1300kg car moving north at 25 m/sec collides with a 2100 kg car moving east at 17 m/sec they stick together in what direction and with what speed do they move after the collision

Solution

Momentum of first car:

$$p_1 = m_1 * v_1 = 1300 * 25 = 32500 \, m * kg/s$$

Momentum of second car:

$$p_1 = m_2 * v_2 = 2100 * 17 = 35700 \, m * kg/s$$

So, according to the sketch above:

$$p_{res} = \sqrt{p_1^2 + p_2^2} = \sqrt{32500^2 + 35700^2} \approx 48277 \, m * \frac{kg}{s}$$

Thus, speed of the collided cars is:

$$p_{res} = (m_1 + m_2)v_{res}$$

$$v_{res} = \frac{p_{res}}{(m_1 + m_2)} = \frac{48277}{(2100 + 1300)} \approx \textbf{14.2 m/s}$$

Angle α can be calculated as:

$$\alpha = \arctan\frac{p_1}{p_2} = \arctan\frac{32500}{35700} \approx \textbf{42.3}°$$

Answer: After collision cars will moved with the speed 14.2 m/s . $\alpha = 42.3°$